Detecting Cataracts From Front-View Retinal Images Using Machine Learning

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Cataracts, which are the clouding of the crystalline lens, are a progressive disease, and its early detection is critical for preventing blindness. There are some manual techniques to detect a cataract, like an ophthalmologist who diagnoses a cataract by using a slit lamp exam. However, many countries lack access to medical facilities, where diseases such as cataracts are a major health issue. Recently, multiple programs have been created that use computer technology such as feature extraction and smartphone applications that utilize algorithms like the Watershed algorithm to detect cataracts. However, these programs have lower accuracy and do not target lower-income areas, making them less accessible. My application, in the form of a mobile app, uses machine learning to detect cataracts from a smartphone camera. The model was trained using front-view retinal images of healthy and cataract-affected eyes. During the initial model training, it was found that the six convolutional layers had low validation and training accuracies, indicating overfitting of the data. To resolve this issue, the convolutional layers were reduced, and more max pooling layers were added. The app allows the user to select an image from their camera roll or import an image from their gallery inti the app. The model then runs the user's input and then outputs the prediction of the front-view retinal images. The research illustrated that the app has potential to help low-income areas without the necessary eye-care facilities to diagnose cataracts in a cost-effective way.

Awards Won:

Central Intelligence Agency: Second Award: $300

U.S. Agency for International Development: Third Award Global Health